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Nakano et al.

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(54) **BURNING TYPE HEAT SOURCE AND FLAVOR INHALER**

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CPC ***A24F 47/008*** (2013.01); ***A24B 15/28*** (2013.01); ***A24D 3/061*** (2013.01); ***A24F 47/006*** (2013.01); ***F23C 3/002*** (2013.01); ***F23Q 7/16*** (2013.01)

(58) **Field of Classification Search**
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(Continued)

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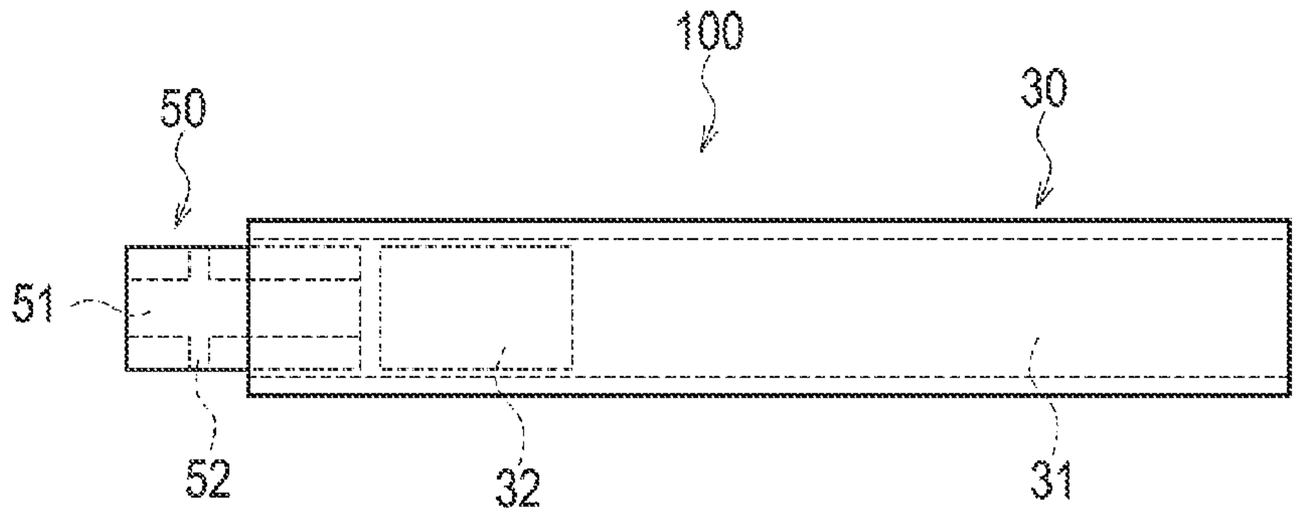
(57) **ABSTRACT**

A burning type heat source (**50**) includes: a single longitudinal hollow (**51**) extending along the first direction (D**1**); and a lateral hollow (**52**) extending along a second direction (D**2**) crossing the first direction (D**1**), the lateral hollow (**52**) communicating with the longitudinal hollow (**51**). The ignition end (**50**Ae) is provided at the ignition end (**50**Ae) side in the first direction relative to a burning position at an end of a second inhalation.

24 Claims, 7 Drawing Sheets



(51) **Int. Cl.**

A24D 3/06	(2006.01)
F23C 3/00	(2006.01)
F23Q 7/16	(2006.01)

(58) **Field of Classification Search**
USPC 128/202.12
See application file for complete search history.

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FIG. 1

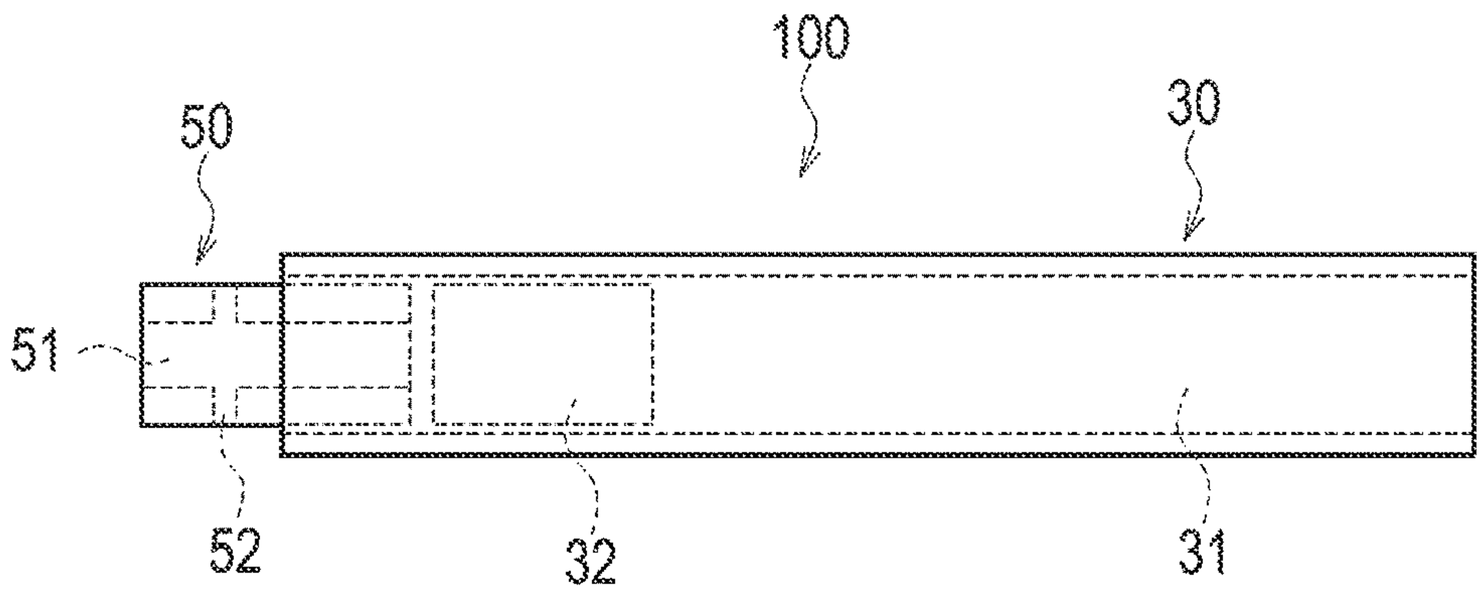


FIG. 2

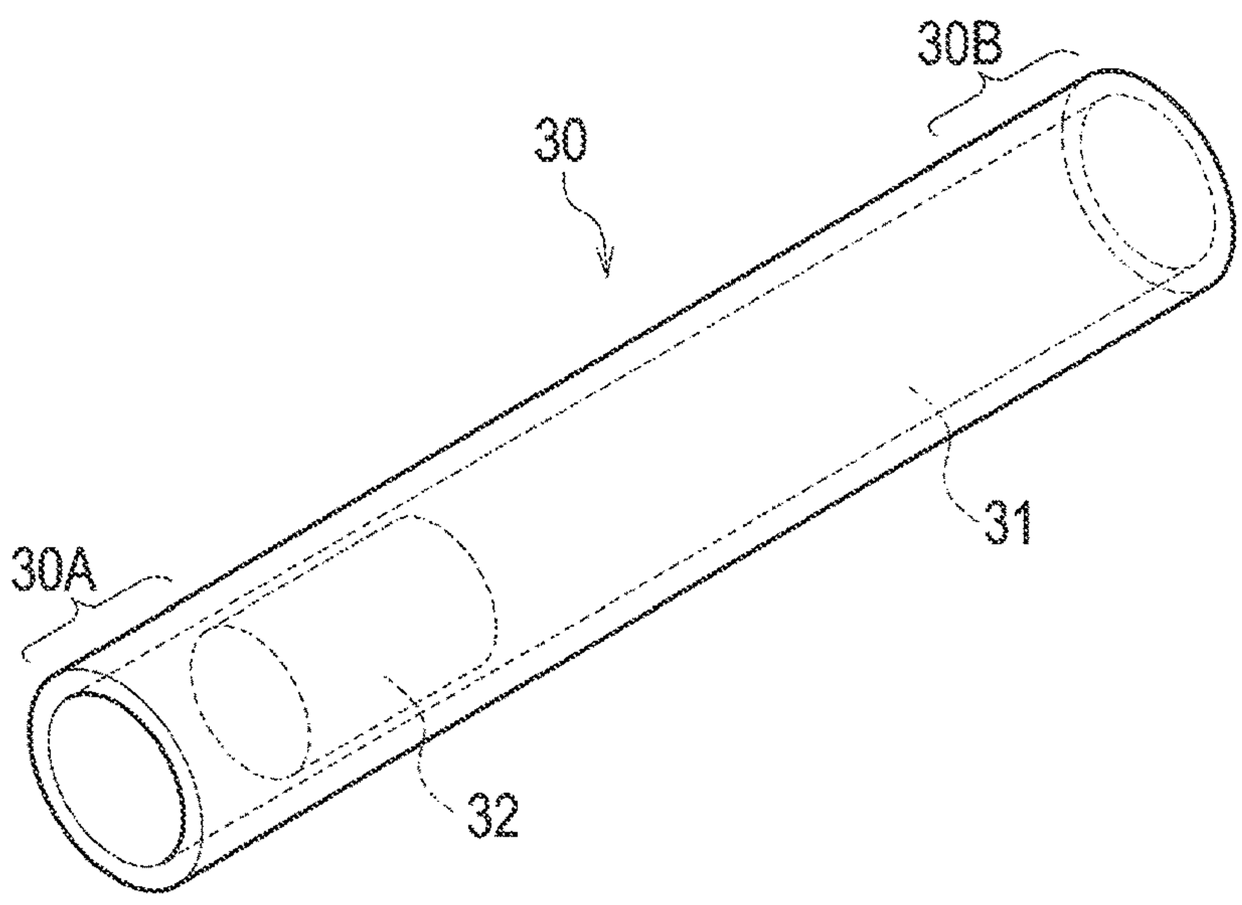


FIG. 3

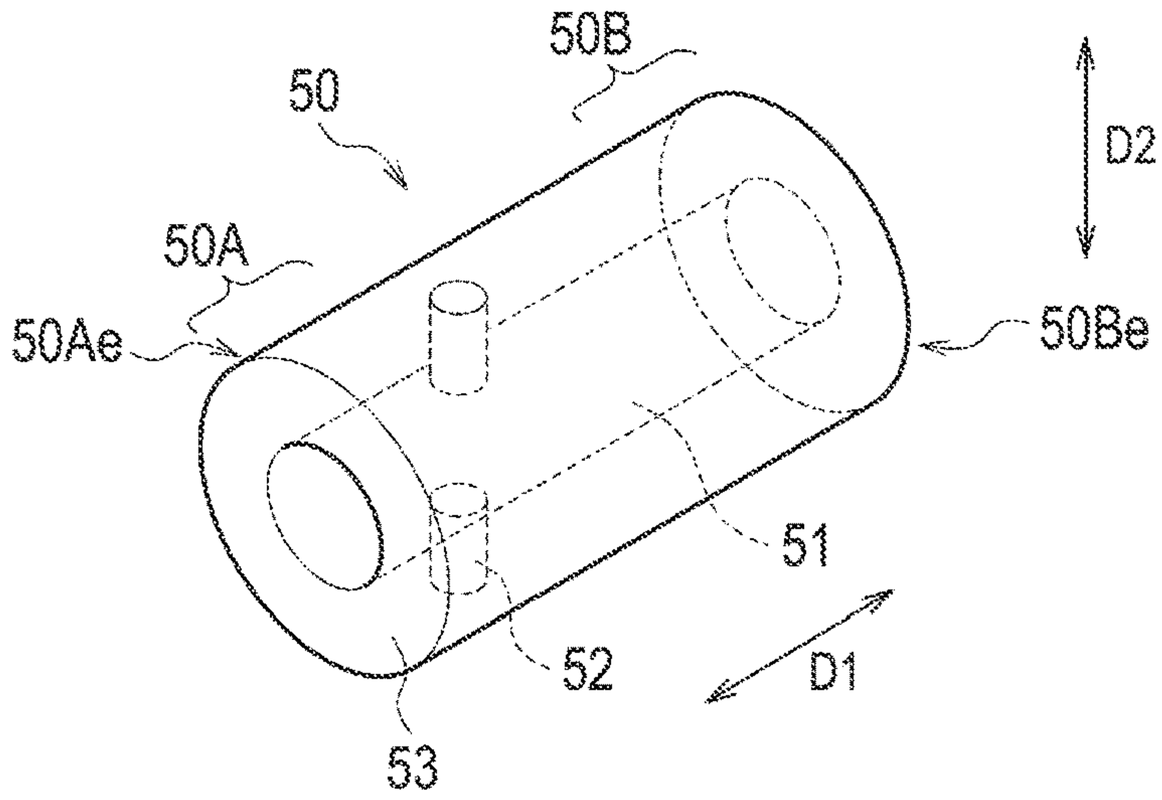

50B
50
D2
50A
50Ae
50Be
51
52
D1
53

FIG. 4

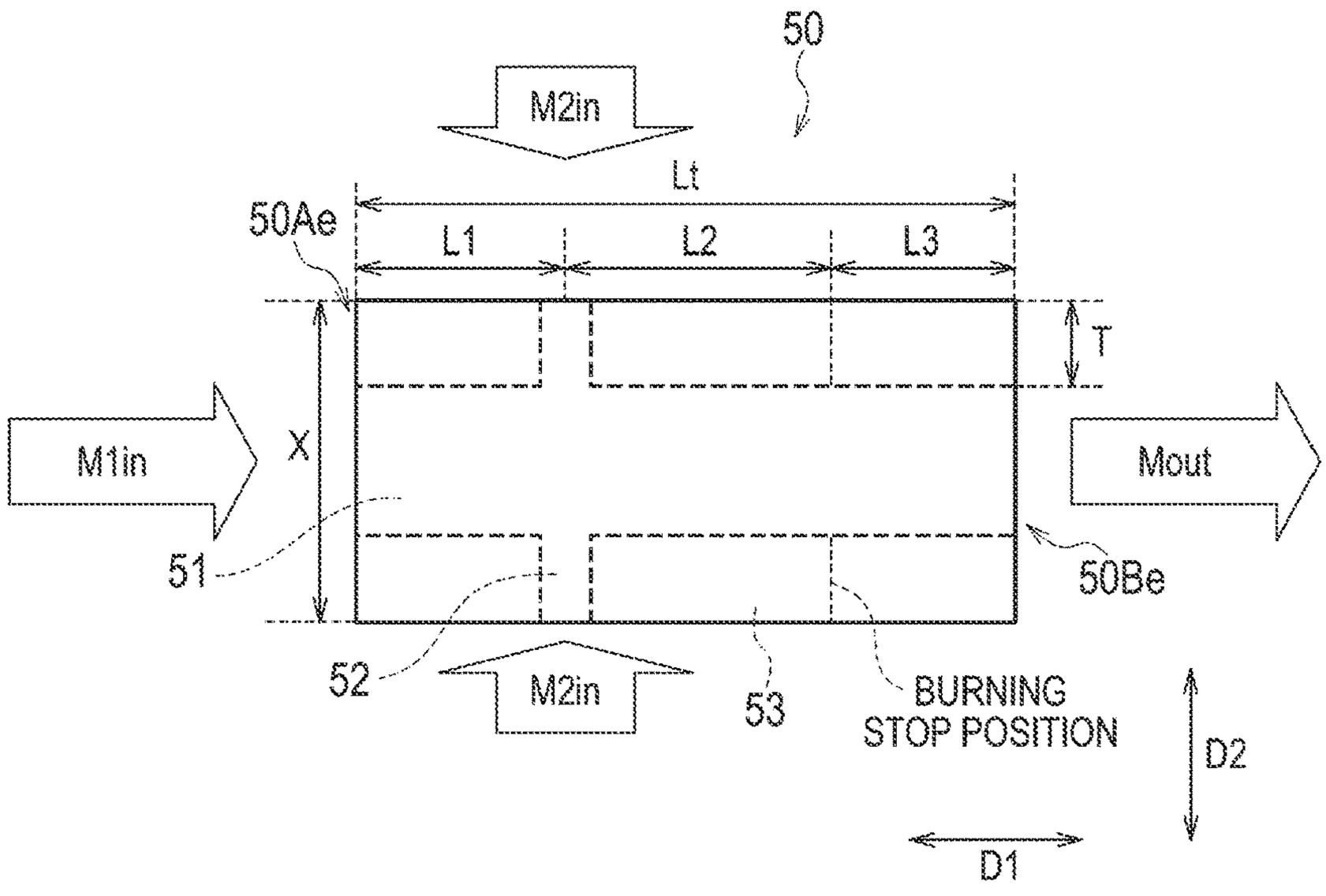

50
M2in
Lt
50Ae
L1
L2
L3
T
M1in
X
Mout
51
50Be
52
M2in
53
BURNING
STOP POSITION
D2
D1

FIG. 5

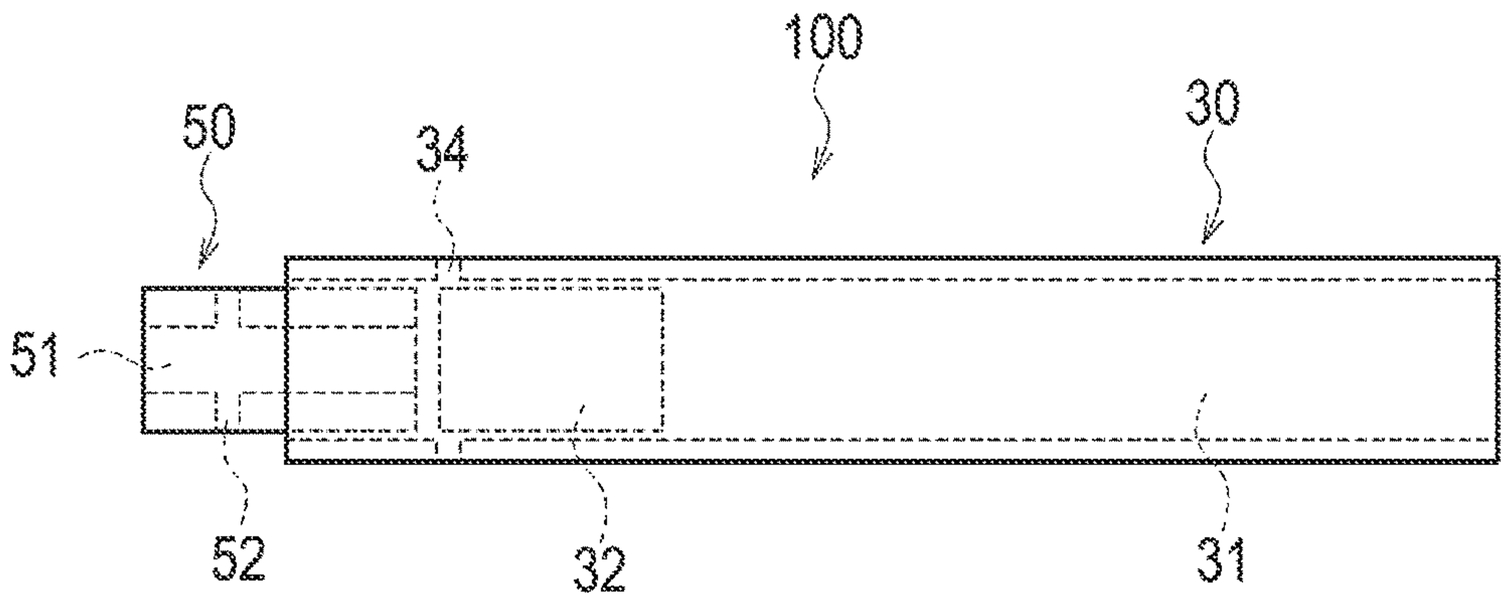


FIG. 6

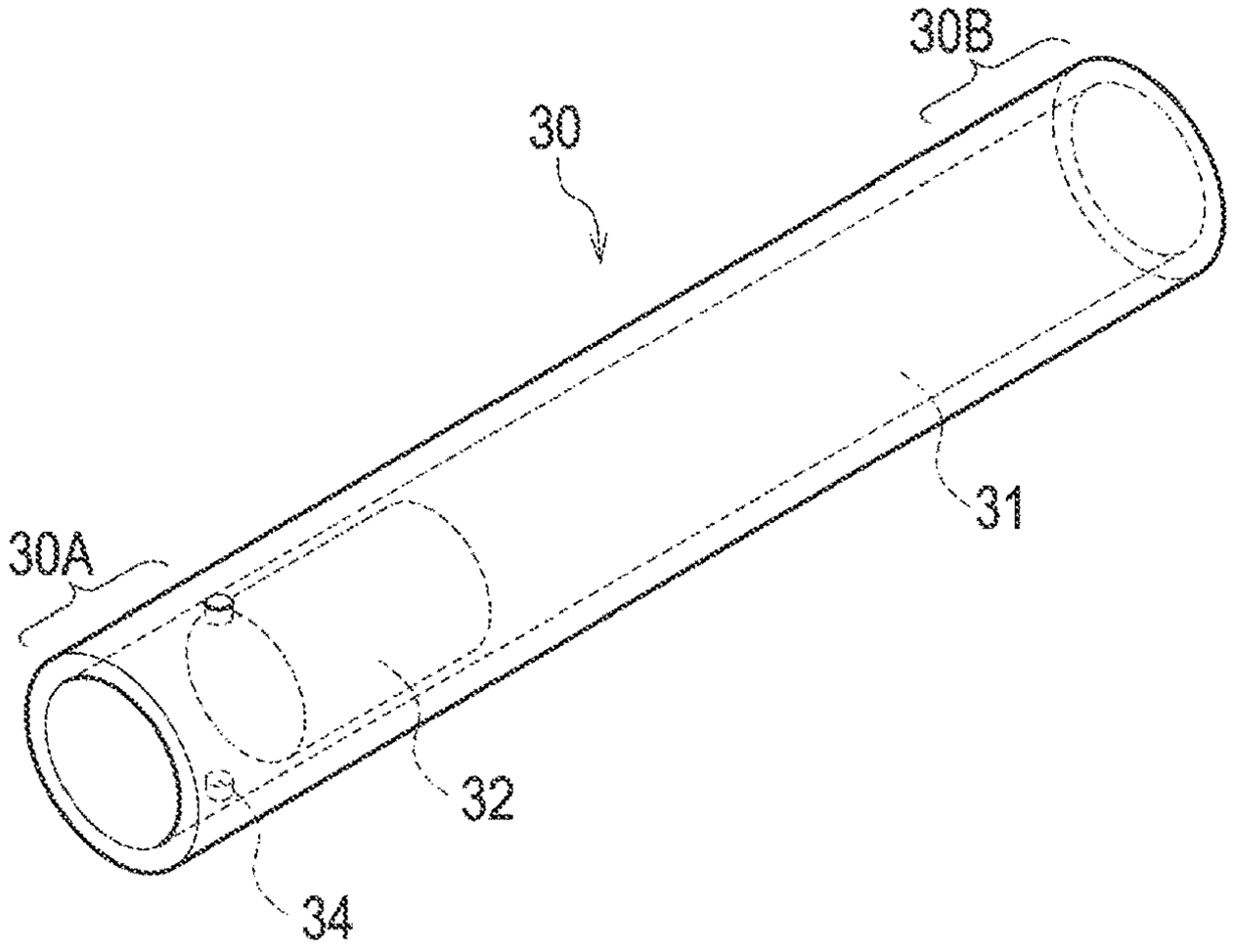


FIG. 7

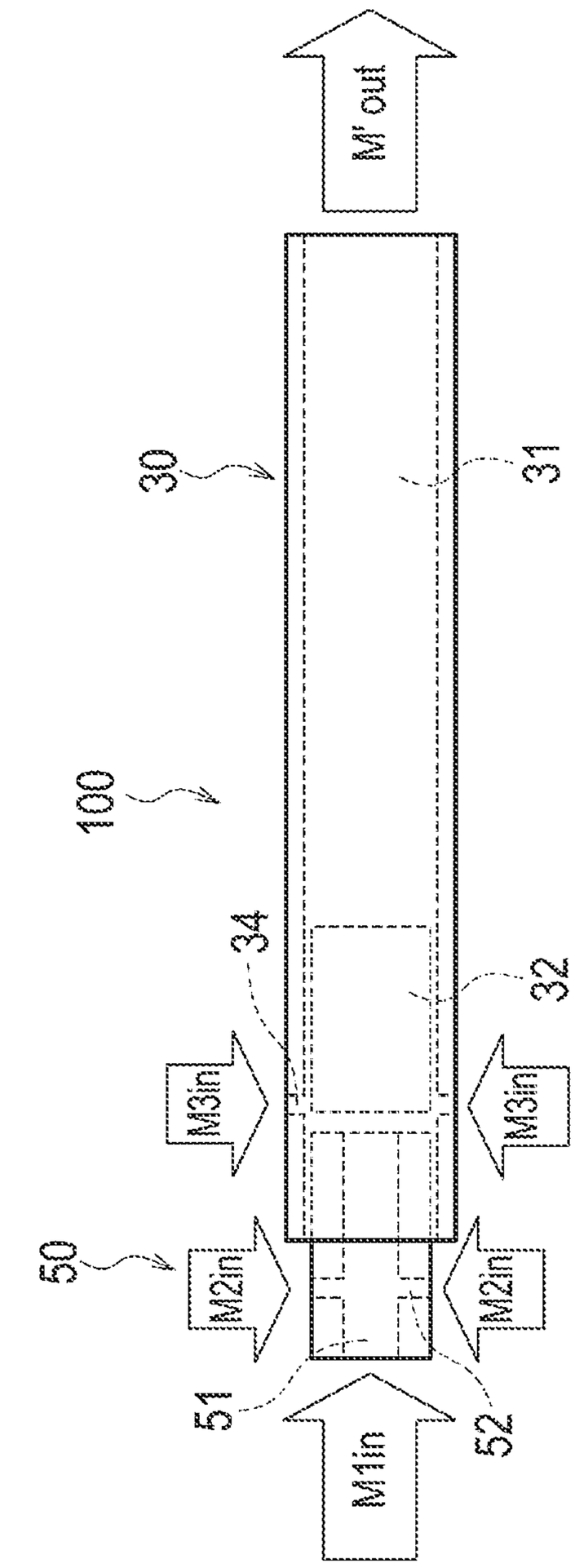


FIG. 8

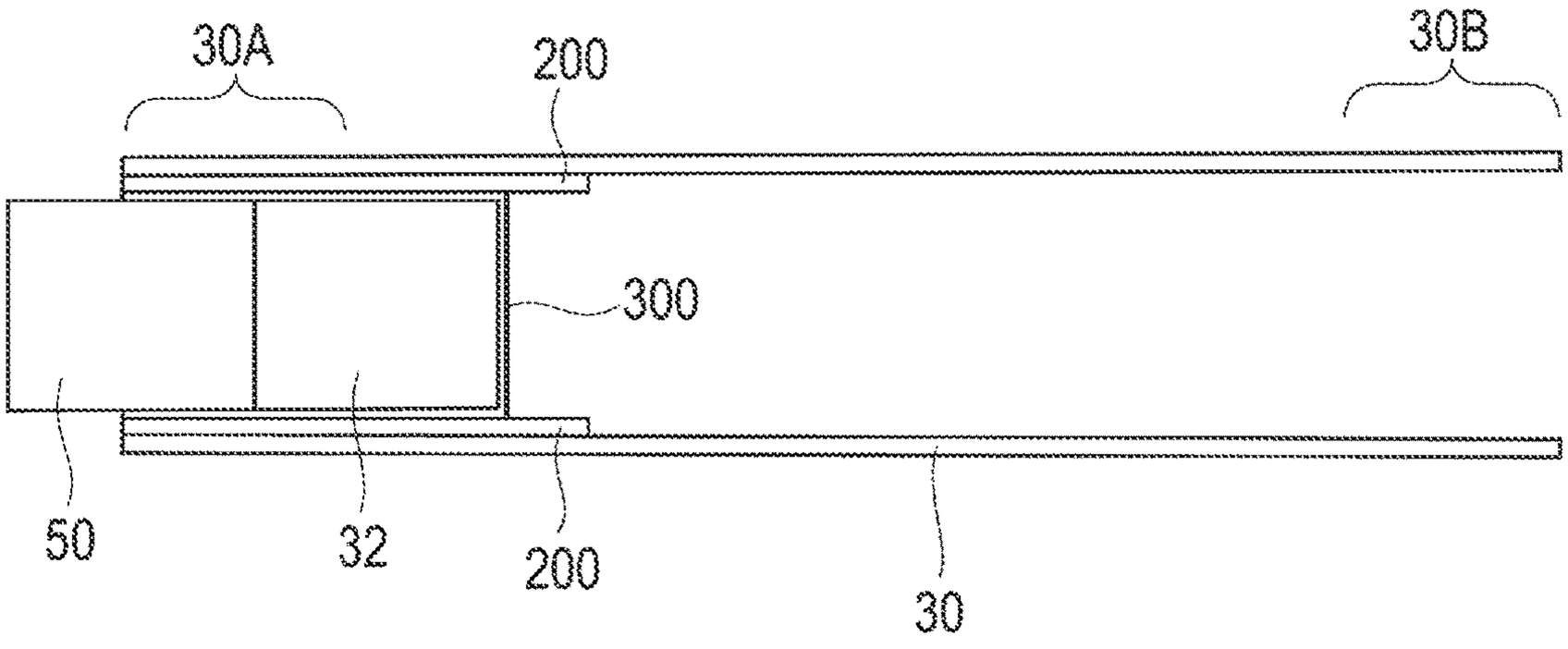


FIG. 9

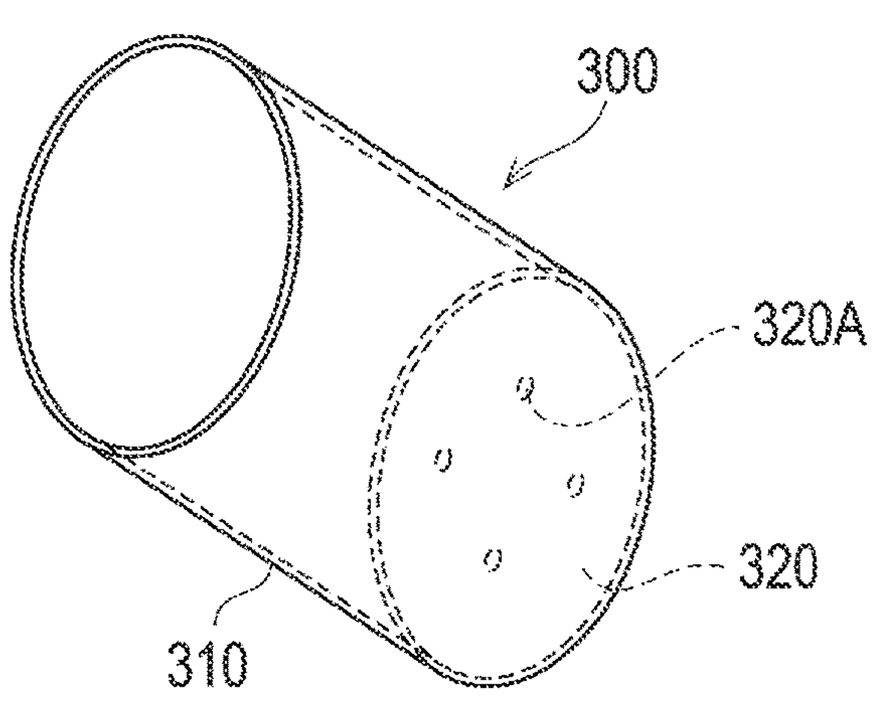


FIG. 10

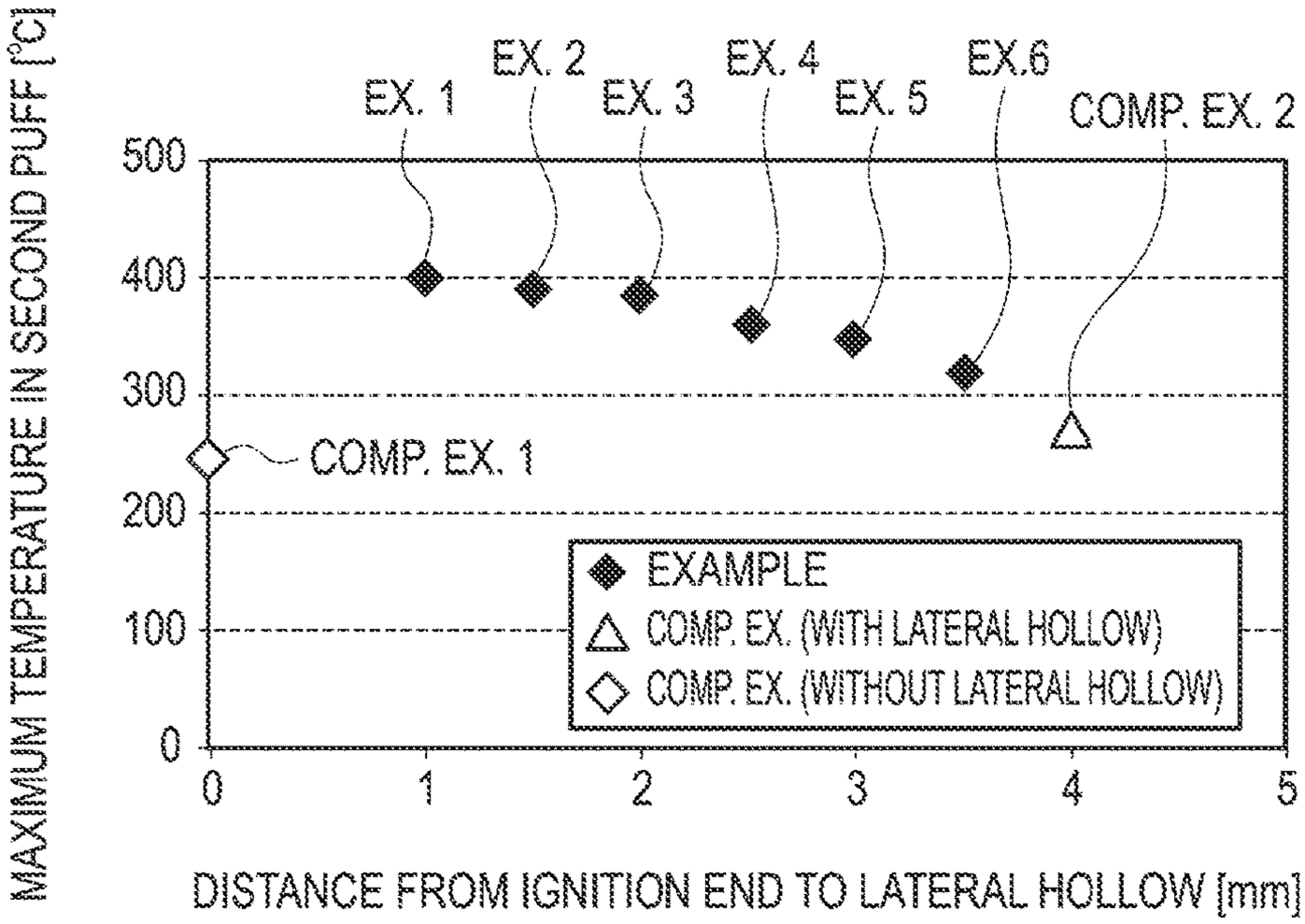

EX. 1
EX. 2
EX. 3
EX. 4
EX. 5
EX.6
COMP. EX. 2
COMP. EX. 1
500
400
300
200
100
0
0
1
2
3
4
5
EXAMPLE
COMP. EX. (WITH LATERAL HOLLOW)
COMP. EX. (WITHOUT LATERAL HOLLOW)
MAXIMUM TEMPERATURE IN SECOND PUFF [°C]
DISTANCE FROM IGNITION END TO LATERAL HOLLOW [mm]

FIG. 11

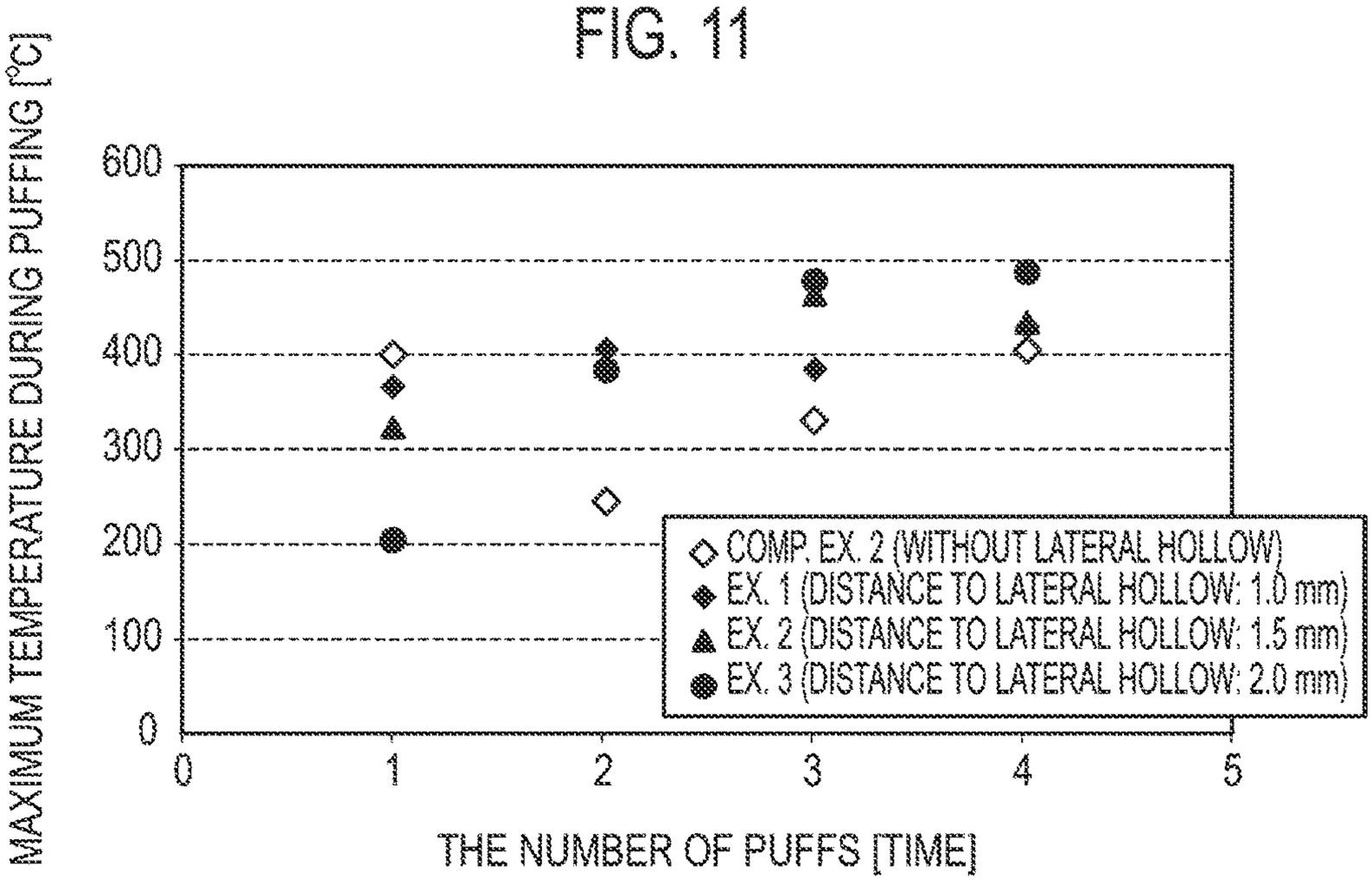
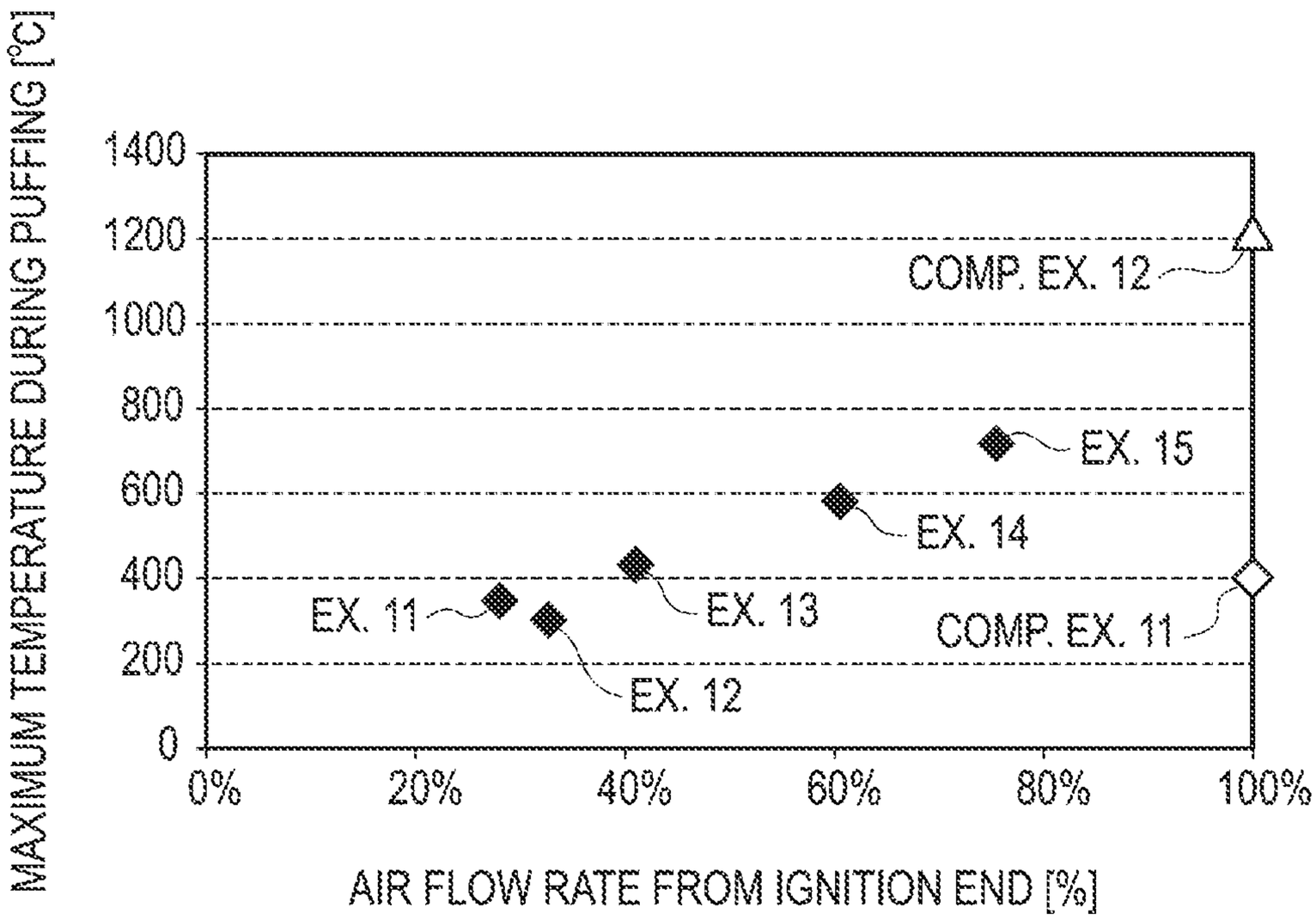

600
500
400
300
200
100
0
0
1
2
3
4
5
COMP. EX. 2 (WITHOUT LATERAL HOLLOW)
EX. 1 (DISTANCE TO LATERAL HOLLOW: 1.0 mm)
EX. 2 (DISTANCE TO LATERAL HOLLOW: 1.5 mm)
EX. 3 (DISTANCE TO LATERAL HOLLOW: 2.0 mm)
MAXIMUM TEMPERATURE DURING PUFFING [°C]
THE NUMBER OF PUFFS [TIME]

FIG. 12


MAXIMUM TEMPERATURE DURING PUFFING [°C]
1400
1200
1000
800
600
400
200
0
0%
20%
40%
60%
80%
100%
AIR FLOW RATE FROM IGNITION END [%]
COMP. EX. 12
EX. 15
EX. 14
EX. 13
EX. 11
EX. 12
COMP. EX. 11

BURNING TYPE HEAT SOURCE AND FLAVOR INHALER

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a Continuation of PCT International Application No. PCT/JP2014/056200 filed on Mar. 10, 2014, which claims priority under 35 U.S.C. § 119(a) to Patent Application Nos. 2013-048092; 2013-048093, and 2013-048094 filed in Japan on Mar. 11, 2013, all of which are hereby expressly incorporated by reference into the present application.

TECHNICAL FIELD

The present invention relates to a burning type heat source and a flavor inhaler which are extends along a direction from an ignition end toward a non-ignition end.

BACKGROUND ART

Conventionally, there is known a flavor inhaler including: a burning type heat source extending along a direction from an ignition end toward a non-ignition end (hereinafter, referred to as "longitudinal axis direction"); and a holder that holds the burning type heat source. There are various types of proposals for such a flavor inhaler.

For example, Patent Literature 1 describes a flavor inhaler which has a burning type heat source including: a lattice partition wall in cross section perpendicular to the longitudinal axis direction; and a plurality of hollows extending along the longitudinal axis direction.

The burning type heat source used for the flavor inhaler is desirably capable of supplying a sufficient and stable heat amount over a plurality of inhalations (hereinafter, referred to as "puffs") performed from ignition to extinction.

In the above-described Patent Literature 1, a combustibility during ignition is improved by increasing a circumferential length of a flow path through which air flows in cross section perpendicular to the longitudinal axis direction. However, variation in a heat amount supplied in puffs performed from ignition to extinction is large, and it is impossible to supply a stable heat amount in puffs performed particularly from the middle to the latter half.

As a result of extensive studies, the inventors found that when a burning type heat source having a tubular shape with only a single hollow extending along the longitudinal axis direction being formed therein is used, for example, so as to reduce a contact area between inflow air flown during puffing and a burning area, it is possible to restrain a variation amount between an amount of heat to be generated during non-puffing (during natural burning) and an amount of heat to be generated during puffing to supply a stable heat amount in a puff performed from the middle to the latter half.

However, as a result of further studies, the inventors found that the above-described configuration of the burning type heat source is not capable of supplying a sufficient heat amount in a few puffs after ignition.

Thus, it is very difficult to achieve both of supplying a stable heat amount in a puff performed from the middle to the latter half and supplying a sufficient heat amount in a few puffs after ignition.

CITATION LIST

Patent Literature

[Patent Literature 1] International Publication WO2010/146693

SUMMARY

A burning type heat source according to a first feature extends along a first direction from an ignition end toward a non-ignition end. The burning type heat source including: a single longitudinal hollow extending along the first direction; and a lateral hollow extending along a second direction crossing the first direction, the lateral hollow communicating with the longitudinal hollow. The lateral hollow is provided at the ignition end side in the first direction relative to a burning position at an end of a second inhalation.

In the first feature, a distance from the ignition end to the lateral hollow in the first direction is less than 4 mm.

In the first feature, a distance from the ignition end to the lateral hollow in the first direction is 1 mm or less.

In the first feature, an area of the longitudinal hollow in cross section perpendicular to the first direction is 1.77 mm^2 or more.

In the first feature, an amount of inflow air flown from the longitudinal hollow at the ignition end is 40% or less of an amount of outflow air flown from the longitudinal hollow at the non-ignition end.

In the first feature, the burning type heat source has a cylindrical shape extending along the first direction. An outer diameter of the burning type heat source is 3 mm or more and 15 mm or less.

In the first feature, a length of the burning type heat source in the first direction is 5 mm or more and 30 mm or less.

A flavor inhaler according to a second feature includes: a burning type heat source extending along a first direction from an ignition end toward a non-ignition end; and a holder holding the burning type heat source. The burning type heat source comprises: a single longitudinal hollow extending along the first direction; and a lateral hollow extending along a second direction crossing the first direction, the lateral hollow communicating with the longitudinal hollow. The lateral hollow is provided at the ignition end side in the first direction relative to a burning position at an end of a second inhalation.

A flavor inhaler according to a third feature includes: a burning type heat source extending along a first direction from an ignition end toward a non-ignition end; and a holder holding the burning type heat source. The burning type heat source comprises: a longitudinal hollow extending along the first direction; and a lateral hollow extending along a second direction crossing the first direction, the lateral hollow communicating with the longitudinal hollow. The lateral hollow is configured to be visible from outside of the holder in the second direction.

In the third feature, the ignition end of the burning type heat source protrudes from the holder. The lateral hollow is exposed from the holder.

In the third feature, a distance from the ignition end to the lateral hollow in the first direction is 5 mm or less.

In the third feature, a burning stop position is provided in the burning type heat source at the non-ignition end side relative to the lateral hollow in the first direction. A distance from the lateral hollow to the burning stop position in the first direction is 5 mm or less.

In the third feature, an area of the longitudinal hollow in cross section perpendicular to the first direction is larger than an area of the lateral hollow in cross section perpendicular to the second direction.

In the third feature, an area of the longitudinal hollow in cross section perpendicular to the first direction is 1.77 mm^2 or more.

In the third feature, the burning type heat source has a cylindrical shape extending along the first direction. An outer diameter of the burning type heat source is 3 mm or more and 15 mm or less.

In the third feature, a length of the burning type heat source in the first direction is 5 mm or more and 30 mm or less.

A flavor inhaler according to a fourth feature includes: a burning type heat source extending along a first direction from an ignition end toward a non-ignition end; and a holder holding the burning type heat source. The burning type heat source has a tubular shape including an outer wall that forms a single longitudinal hollow extending along the first direction. An area of the longitudinal hollow in cross section perpendicular to the first direction is 1.77 mm^2 or more. An amount of inflow air flown from the longitudinal hollow at the ignition end is 75% or less of an amount of outflow air flown from a mouthpiece of the flavor inhaler.

In the fourth feature, the amount of inflow air flown from the longitudinal hollow at the ignition end is 40% or less of the amount of outflow air flown from the mouthpiece of the flavor inhaler.

In the fourth feature, the burning type heat source comprises a lateral hollow extending along a second direction crossing the first direction, the lateral hollow communicating with the longitudinal hollow.

In the fourth feature, the holder has a holder-side hollow opening toward a second direction crossing the first direction.

In the fourth feature, the holder houses a flavor source. The holder-side hollow is provided at an outer part of the flavor source or at the ignition end side relative to the outer part of the flavor source in the second direction.

In the fourth feature, the holder houses a capsule filter. The holder-side hollow is provided at an outer part of the capsule filter or at the ignition end side relative to the outer part of the capsule filter in the second direction.

In the fourth feature, the burning type heat source has a cylindrical shape extending along the first direction. An outer diameter of the burning type heat source is 3 mm or more and 15 mm or less.

In the fourth feature, a length of the burning type heat source in the first direction is 5 mm or more and 30 mm or less.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a drawing showing a flavor inhaler **100** according to a first embodiment.

FIG. **2** is a drawing showing a holder **30** according to the first embodiment.

FIG. **3** is a drawing showing a burning type heat source **50** according to the first embodiment.

FIG. **4** is a drawing for explaining an air flow amount according to the first embodiment.

FIG. **5** is a drawing showing a flavor inhaler **100** according to a first modification.

FIG. **6** is a drawing showing a holder **30** according to the first modification.

FIG. **7** is a drawing for explaining an air flow amount according to the first modification.

FIG. **8** is a drawing showing a flavor inhaler according to a third modification.

FIG. **9** is a drawing showing a cup member **300** according to the third modification.

FIG. **10** is a drawing showing an experiment result 1.

FIG. **11** is a drawing showing an experiment result 2.

FIG. **12** is a drawing showing an experiment result 3.

DESCRIPTION OF EMBODIMENTS

Hereinafter, the embodiments of the present invention will be described with reference to the drawings. In the following drawings, identical or similar components are denoted by identical or similar reference numerals.

Therefore, specific dimensions should be determined with reference to the description below. It is needless to mention that different relationships and ratio of dimensions may be included in different drawings.

Summary of Embodiment

A burning type heat source according to an embodiment extends along a first direction from an ignition end toward a non-ignition end. The burning type heat source includes: a single longitudinal hollow extending along the first direction; and a lateral hollow extending along a second direction crossing the first direction, the lateral hollow communicating with the longitudinal hollow. The lateral hollow is provided at the ignition end side in the first direction relative to a burning position at an end of a second inhalation.

In the embodiment, the burning type heat source has the single longitudinal hollow extending along the first direction. This reduces a contact area between inflow air flown during puffing and a burning area, and thus, it is possible to restrain a variation amount between an amount of heat to be generated during non-puffing (during natural burning) and an amount of heat to be generated during puffing, and it is possible to supply a stable heat amount in a puff performed from the middle to the latter half.

In the embodiment, the burning type heat source has a lateral hollow communicating with the longitudinal hollow, and the lateral hollow is provided at the ignition end side relative to the burning position at an end of a second inhalation. As a result, an initial burning is promoted by air supplied from the lateral hollow, and it is possible to increase a heat amount supplied at least in a second puff.

Thus, it is possible to achieve both of supplying a stable heat amount in a puff performed from the middle to the latter half and increasing a heat amount supplied in a few puffs after ignition.

First Embodiment

Flavor Inhaler

A flavor inhaler according to a first embodiment will be described, below. FIG. **1** is a drawing showing a flavor inhaler **100** according to the first embodiment. FIG. **2** is a drawing showing a holder **30**. FIG. **3** is a drawing showing a burning type heat source **50**.

As shown in FIG. **1**, the flavor inhaler **100** has the holder **30** and the burning type heat source **50**. In the first embodiment, it should be noted that the flavor inhaler **100** is a flavor inhaler without burning a flavor source.

As shown in FIG. **2**, the holder **30** holds the burning type heat source **50**. The holder **30** has a supporting end portion **30**A and a mouthpiece side end portion **30**B. The supporting end portion **30**A is an end portion that holds the burning type heat source **50**. The mouthpiece side end portion **30**B is an end portion provided at a mouthpiece side of the flavor inhaler. In the first embodiment, the mouthpiece side end portion **30**B configures a mouthpiece of the flavor inhaler **100**. However, the mouthpiece of the flavor inhaler **100** may be provided separately of the holder **30**.

The holder **30** has a tubular shape having a hollow **31** extending along a direction from the supporting end portion **30**A toward the mouthpiece side end portion **30**B. For example, the holder **30** has a cylindrical shape or a rectangular tubular shape.

In the first embodiment, the holder **30** houses a flavor source **32**. The flavor source **32** releases a flavor by transmitted a heat generated from the burning type heat source **50**, for example. As the flavor source **32**, for example, it is possible to use a tobacco leaf and adopt general shredded tobacco used in a cigarette (paper-wrapped tobacco), granular tobacco used in a snuff, and a tobacco raw material of a roll tobacco, a tobacco compact, etc. Further, a support made of a porous material or a non-porous material may be adopted as the flavor source **32**.

The roll tobacco is obtained by forming a sheet-like regenerated tobacco into a roll, and has a flow path therein. Further, the tobacco compact is obtained by mold-forming the granular tobacco. Moreover, the tobacco raw material or the support used as the above-described flavor source **32** may include a desired flavor.

In the first embodiment, a case in which the holder **30** has a tubular shape is shown as an example. However, the embodiment is not limited thereto. That is, the holder **30** may suffice to have a configuration for holding the burning type heat source **50**.

As shown in FIG. **3**, the burning type heat source **50** has an ignition end portion **50**A and a non-ignition end portion **50**B. The ignition end portion **50**A is an end portion that is exposed from the holder **30** in a state where the burning type heat source **50** is inserted into the holder **30**. The non-ignition end portion **50**B is an end portion that is inserted into the holder **30**.

Specifically, the burning type heat source **50** has a shape extending along a first direction D**1** from the ignition end **50**Ae toward the non-ignition end **50**Be. The burning type heat source **50** has a longitudinal hollow **51**, a lateral hollow **52** and an outer wall **53**.

The longitudinal hollow **51** is partitioned by the outer wall **53** and has a shape extending along the first direction D**1**. An area of the longitudinal hollow **51** in cross section perpendicular to the first direction D**1** is larger than an area of the lateral hollow **52** in cross section perpendicular to a second direction D**2**. For example, the area of the longitudinal hollow **51** in cross section perpendicular to the first direction D**1** is preferably 1.77 mm^2 or more.

In the first embodiment, it should be noted that the number of longitudinal hollows **51** formed in the burning type heat source **50** is singular.

The lateral hollow **52** extends along the second direction D**2** crossing the first direction D**1** and communicates with the longitudinal hollows **51**. Further, the second direction D**2** has only to cross the first direction D**1**, and may not be perpendicular to the first direction D**1**.

Here, in the first direction D**1**, the lateral hollow **52** is provided at the ignition end **50**Ae side relative to the burning position at an end of a second inhalation. That is, a distance (L**1** shown in FIG. **4**) from the ignition end **50**Ae to the lateral hollow **52** is shorter than a distance from the ignition end **50**Ae to the burning position at the end of the second inhalation. For example, the distance from the ignition end **50**Ae to the lateral hollow **52** in the first direction D**1** is preferably less than 4 mm. In addition, the distance from the ignition end **50**Ae to the lateral hollow **52** in the first direction D**1** is preferably 1 mm or less.

Further, in the first direction D**1**, L**2** shown in FIG. **4** denotes a distance from the lateral hollow **52** to a boundary position between the burning type heat source **50** and the holder **30**, that is, in a state where the burning type heat source **50** is inserted into the holder **30**, to a boundary position between a part of the burning type heat source **50** exposed from the holder **30** and a part of the burning type heat source **50** not exposed from the holder **30**. Therefore, a distance (L**3** shown in FIG. **4**) from the boundary position to the non-ignition end **50**Be in the first direction D**1** is an amount by which the burning type heat source **50** is inserted into the holder **30**.

In the first embodiment, the number of lateral hollows **52** formed in the burning type heat source **50** is not limitative in particular, and may be singular or plural. Here, in a case where the burning type heat source **50** is provided with a plurality of lateral hollows **52**, at least, the lateral hollow **52** provided at a position closest to the ignition end **50**Ae is provided at the ignition end **50**Ae side relative to the burning position at an end of a second inhalation.

In a state where the holder **30** holds the burning type heat source **50**, the lateral hollow **52** is preferably configured to be visible from outside of the holder **30** in the second direction D**2**. For example, in a state where the holder **30** holds the burning type heat source **50**, the ignition end **50**Ae of the burning type heat source **50** protrudes from the holder **30** and the lateral hollow **52** is exposed from the holder **30**.

The outer wall **53** has a tubular shape defining the longitudinal hollow **51**. A thickness (T shown in FIG. **4**) of the outer wall **53** may be 0.5 mm or more and 7.0 mm or less, and preferably, be 0.75 mm or more and 3.0 mm or less.

In the first embodiment, a size (Lt shown in FIG. **4**) of the burning type heat source **50** in the first direction D**1** is preferably 5 mm or more and 30 mm or less. Further, a size (X shown in FIG. **4**) of the burning type heat source **50** in the second direction D**2** is preferably 3 mm or more and 15 mm or less.

Here, when the burning type heat source **50** has a cylindrical shape, the size of the burning type heat source **50** in the second direction D**2** is an outer diameter of the burning type heat source **50**. When the burning type heat source **50** does not have a cylindrical shape, the size of the burning type heat source **50** in the second direction D**2** is a maximum value of the burning type heat source **50** in the second direction D**2**.

The burning type heat source **50** is configured by a mixture including a flammable substance. For example, as the burning type heat source **50**, it is possible to use, for example, a carbon heat source which may be obtained by integrally molding a mixture including a carbonaceous material, a nonflammable additive, a binder (organic binder or inorganic binder), and water by a method such as extrusion molding, tablet molding, and pressure slip casting, or a tobacco compact in which a powdery and granular body of tobacco leaf substitutes for a part or all of a carbonaceous material.

The burning type heat source **50** preferably comprises a carbonaceous material in a range of 10 wt % to 99 wt % when a weight of the burning type heat source **50** is 100 wt

%. As the carbonaceous material, that which is plant-derived and obtained by removing a volatile impurity through a heat treatment, etc., is preferably used. In view of a burning characteristic such as supplying of a sufficient heat amount and tightening of ash, the burning type heat source **50** preferably comprises a carbonaceous material in a range of 30 wt % to 70 wt %, and more preferably comprises a carbonaceous material in a range of 40 wt % to 50 wt %.

Examples of the organic binder may include a mixture including at least one of CMC (carboxymethyl cellulose), CMC-Na (carboxymethyl-cellulose sodium), alginate, EVA, PVA, PVAC, and saccharides.

Examples of the inorganic binder may include a mineral-based binder such as purified bentonite or a silica-based binder such as colloidal silica, water glass, and calcium silicate.

For example, in view of a flavor, when the weight of the burning type heat source **50** is 100 wt %, the binder preferably comprises 1 wt % to 10 wt % of CMC, and preferably comprises 1 wt % to 8 wt % of CMC.

Examples of the nonflammable additive may use a carbonate or an oxide including sodium, potassium, calcium, magnesium, and silicon, etc. The burning type heat source **50** may comprise 10 wt % to 89 wt % of the nonflammable additive when the weight of the burning type heat source **50** is 100 wt %. Further, when calcium carbonate is used as the nonflammable additive, the burning type heat source **50** preferably comprises 40 wt % to 55 wt % of the nonflammable additive, and the tobacco compact preferably comprises 10 wt % to 30 wt % of the nonflammable additive.

In order to improve a burning characteristic, the burning type heat source **50** may comprise 5 wt % or less, preferably 1 wt % or less, of alkali metal salts such as sodium chloride when the weight of the burning type heat source **50** is 100 wt %.

(Air Flow Amount)

An air flow amount according to the first embodiment will be described, below. FIG. **4** is a drawing for explaining the air flow amount according to the first embodiment.

As shown in FIG. **4**, at the time of ignition of the burning type heat source **50**, an amount of air flown into the longitudinal hollow **51** at the ignition end **50**Ae is expressed by "M1in". At the time of ignition of the burning type heat source **50**, an amount of outflow air flown from the longitudinal hollow **51** at the non-ignition end **50**Be is expressed by "Mout". An amount of air flown into the longitudinal hollow **51** from each lateral hollow **52** at the time of ignition of the burning type heat source **50** is expressed by "M2in". Accordingly, a relationship of Mout=M1in+ΣM2in is satisfied.

In such a case, the amount of air (M1in) flown into the longitudinal hollow **51** at the ignition end **50**Ae is preferably 75% or less of the amount of flowout air (Mout) flown from the longitudinal hollow **51** at the non-ignition end **50**Be. Further, the amount of air (M1in) flown into the longitudinal hollow **51** at the ignition end **50**Ae is preferably 40% or less of the amount of flowout air (Mout) flown from the longitudinal hollow **51** at the non-ignition end **50**Be.

In the first embodiment, the number of lateral hollows **52** formed in the burning type heat source **50** and the area of the lateral hollow **52** in cross section perpendicular to the second direction D**2** are configured to satisfy such a condition.

In the first embodiment, the holder **30** does not have a hollow opening toward the second direction D**2** crossing the first direction D**1**. Therefore, when the amount of air (M1in) flown into the longitudinal hollow **51** at the ignition end **50**Ae is 75% or less of the amount of outflow air (Mout) flown from the longitudinal hollow **51** at the non-ignition end **50**Be, the amount of air (M1in) is 75% or less of an amount of outflow air flown from the mouthpiece of the flavor inhaler **100**.

(Operation and Effect)

In the first embodiment, the burning type heat source **50** has a single longitudinal hollow **51** extending along the first direction. Therefore, by reducing a contact area between inflow air flown during puffing and a burning area, it is possible to restrain a variation amount between an amount of heat to be generated during non-puffing (during natural burning) and an amount of heat to be generated during puffing and it is possible to supply a stable heat amount in a puff performed from the middle to the latter half.

In the first embodiment, the burning type heat source **50** has the lateral hollow **52** communicating with the longitudinal hollow **51**. The lateral hollow **52** is provided at the ignition end **50**Ae side in the first direction D**1** relative to the burning position at an end of a second inhalation. As a result, an initial burning is promoted by air supplied from the lateral hollow **52**, and it is possible to increase a heat amount supplied in at least second puff.

Thus, it is possible to achieve both of supplying a stable heat amount in a puff performed from the middle to the latter half and increasing a heat amount supplied in a few puffs after ignition.

As described above, the distance from the ignition end **50**Ae to the lateral hollow **52** in the first direction D**1** is preferably less than 4 mm. As a result, an initial burning is promoted by air supplied from the lateral hollow **52**, and it is possible to supply a sufficient heat amount in a few puffs after ignition. In addition, the distance from the ignition end **50**Ae to the lateral hollow **52** in the first direction D**1** is preferably 1 mm or less. As a result, it is possible to supply a more stable heat amount in a few puffs after ignition.

In the first embodiment, the area of the longitudinal hollow **51** in cross section perpendicular to the first direction D**1** is larger than the area of the lateral hollow **52** in cross section perpendicular to the second direction D**2**.

In the first embodiment, the area of the longitudinal hollow **51** in cross section perpendicular to the first direction D**1** is preferably 1.77 mm^2 or more. As a result, pressure loss that occurs at the time of inhalation is reduced, and it enables a user to smoothly suck a flavor inhaler.

In the first embodiment, the amount of air (M1in) flown into the longitudinal hollow **51** at the ignition end **50**Ae is preferably 75% or less of the amount of outflow air (Mout) flown from the longitudinal hollow **51** at the non-ignition end **50**Be. Further, the amount of air (M1in) flown into the longitudinal hollow **51** at the ignition end **50**Ae is preferably 40% or less of the amount of outflow air (Mout) flown from the longitudinal hollow **51** at the non-ignition end **50**Be. This restrains a flame of a gas lighter from flowing into the longitudinal hollow **51**.

Thus, it is possible to achieve both of supplying a stable heat amount in a puff performed from the middle to the latter half and restraining a flame of a gas lighter from flowing into during ignition.

In a first feature, the burning type heat source **50** has a cylindrical shape extending along the first direction D**1**, and the outer diameter of the burning type heat source **50** is 3 mm or more and 15 mm or less. Further, a length of the burning type heat source **50** in the first direction D**1** is 5 mm or more and 30 mm or less. As a result, it is possible to supply a sufficient heat amount over a sufficient time to the

flavor source **32** housed in the holder **30** while appropriately suppressing an increase in the size of the burning type heat source **50**.

In the first embodiment, the lateral hollow **52** communicating with the longitudinal hollow **51** is configured to be visible from outside of the holder **30** in the second direction D**2**. Therefore, since the lateral hollow **52** which is visible from outside of the holder **30** turns red by a burning of the burning type heat source **50**, a visibility of burning state of the burning type heat source **50** is improved, and thus, a user is capable of visually confirming the burning state of the burning type heat source **50** even while holding the flavor inhaler **100** in the mouth.

[First Modification]

A first modification of the first embodiment will be described, below. Description proceeds with a particular focus on a difference from the first embodiment, below.

Specifically, in the first embodiment, the holder **30** does not have a hollow opening toward the second direction D**2** crossing the first direction D**1**. Therefore, when the amount of air (M1in) flown into the longitudinal hollow **51** at the ignition end **50**Ae is 75% or less of the amount of outflow air (Mout) flown from the longitudinal hollow **51** at the non-ignition end **50**Be, the amount of air (M1in) is 75% or less of an amount of outflow air flown from the mouthpiece of the flavor inhaler **100**.

In contrast, in the first modification, as shown in FIG. **5** and FIG. **6**, the holder **30** has a holder-side hollow **34** which communicates with the hollow **31** and which opens toward the second direction D**2** crossing the first direction D**1**. Further, the second direction D**2** has only to cross the first direction D**1**, and may not be perpendicular to the first direction D**1**.

In the second direction D**2**, the holder-side hollow **34** is preferably provided at an outer part of the flavor source **32** or at the ignition end **50**Ae side relative to the outer part of the flavor source **32**.

(Air Flow Amount)

An air flow amount according to the first modification will be described, below. FIG. **7** is a drawing for explaining the air flow amount according to the first modification.

As shown in FIG. **7**, at the time of ignition of the burning type heat source **50**, an amount of air flown into the longitudinal hollow **51** at the ignition end **50**Ae is expressed by "M1in". An amount of outflow air flown from the mouthpiece of the flavor inhaler **100** at the time of ignition of the burning type heat source **50** is expressed by "M'out". An amount of air flown into the longitudinal hollow **51** from each lateral hollow **52** at the time of ignition of the burning type heat source **50** is expressed by "M2in". An amount of air flown into the hollow **31** from each holder-side hollow **34** at the time of ignition of the burning type heat source **50** is expressed by "M3in". Accordingly, a relationship of $M'out=M1in+\Sigma M2in+\Sigma M3in$ is satisfied.

In such a case, the amount of air (M1in) flown into the longitudinal hollow **51** at the ignition end **50**Ae is 75% or less of the amount of outflow air (M'out) flown from the mouthpiece of the flavor inhaler **100**. Further, the amount of air (M1in) flown into the longitudinal hollow **51** at the ignition end **50**Ae is preferably 40% or less of the amount of outflow air (M'out) flown from the mouthpiece of the flavor inhaler **100**.

In the first modification, the number of lateral hollows **52** formed in the burning type heat source **50**, the area of the lateral hollow **52** in cross section perpendicular to the second direction D**2**, the number of holder-side hollows **34** formed in the holder **30**, and an area of the holder-side hollow **34** in cross section perpendicular to the second direction D**2** are configured to satisfy such a condition.

(Operation and Effect)

In the first modification, the amount of air (M1in) flown into the longitudinal hollow **51** at the ignition end **50**Ae is 75% or less of the amount of outflow air (M'out) flown from the mouthpiece of the flavor inhaler **100**. Further, the amount of air (M1in) flown into the longitudinal hollow **51** at the ignition end **50**Ae is preferably 40% or less of the amount of outflow air (M'out) flown from the mouthpiece of the flavor inhaler **100**. This restrains a flame of a gas lighter from flowing into the longitudinal hollow **51**.

In the first modification, the holder-side hollow **34** is preferably provided at the outer part of the flavor source **32** or at the ignition end **50**Ae side relative to the outer part of the flavor source **32** in the second direction D**2**. This restrains a decrease in the quantity of airflow to the flavor source **32** and restrains a flavor ingredient volatilized from the flavor source **32** from being diluted by air flown into the hollow **31** from the holder-side hollow **34**.

[Second Modification]

A second modification of the first embodiment is described, below. Description proceeds with a particular focus on a difference from the first embodiment, below.

As described above, in the first embodiment, the lateral hollow **52** is provided at the ignition end **50**Ae side relative to the burning position at an end of a second inhalation in the first direction D**1**.

In contrast, in the second modification, the distance (L**1** shown in FIG. **4**) from the ignition end **50**Ae to the lateral hollow **52** in the first direction D**1** is preferably 5 mm or less. As a result, since the lateral hollow **52** which is provided to be visible from outside of the holder **30** turns red by a burning of the burning type heat source **50**, a user is capable of visually confirming the burning state of the burning type heat source **50** even in a puff performed in the former half while holding the flavor inhaler **100** in the mouth, so that it is possible for the user to confirm without stress whether the burning type heat source **50** is ignited uniformly and sufficiently after ignition by a lighter, etc. The distance (L**2** shown in FIG. **4**) from the lateral hollow **52** to a burning stop position in the first direction D**1** is preferably 5 mm or less. As a result, the user is capable of visually confirming the burning state of the burning type heat source **50** even in a puff performed in the later half while holding the flavor inhaler **100** in the mouth, and is capable of easily confirming that the burning type heat source **50** reaches a position to stop burning.

In the second modification, the lateral hollow **52** may be provided at both a position at a distance of 5 mm or less from the ignition end **50**Ae and a position at a distance of 5 mm or less to the burning stop position. Alternatively, the lateral hollow **52** may be provided at either one of the position at a distance of 5 mm or less from the ignition end **50**Ae and the position at a distance of 5 mm or less to the burning stop position.

The burning stop position is a position where the burning type heat source **50** should stop burning before a burning of the outer circumference surface of the burning type heat source **50** reaches a predetermined position. The predetermined position is a boundary position between a part exposed from the holder **30** and a part not exposed from the holder **30** in a state where the holder **30** holds the burning type heat source **50**. The burning stop position, for example, is provided within a range of 1 mm or more and 5 mm or less from the boundary position. Preferably, the burning stop position is provided within a range of 3 mm or more and 5

mm or less. Therefore, the distance (L3 shown in FIG. **4**) from the burning stop position to the non-ignition end **50**Be in the first direction D**1** is an amount by which the burning type heat source **50** is inserted into the holder **30**.

In the second modification, the number of lateral hollows **52** formed in the burning type heat source **50** is not limitative in particular, and may be singular or plural. Here, in a case where a plurality of lateral hollows **52** are provided, at least lateral hollow **52** provided at a position closest to the ignition end **50**Ae is provided within a range of 5 mm or less from the ignition end **50**Ae or a lateral hollow **52** provided at a position closest to the burning stop position is provided within a range of 5 mm or less from the burning stop position.

It should be noted that the position where the lateral hollow **52** is provided in the second modification can be made compatible with the position where the lateral hollow **52** is provided in the first embodiment.

In the second modification, the number of longitudinal hollows **51** formed in the burning type heat source **50** need not be singular. That is, the number of longitudinal hollows **51** formed in the burning type heat source **50** may be plural. Moreover, in such a case, the lateral hollow **52** may communicate with at least one of a plurality of the longitudinal hollows **51**.

In the second modification, it should be noted that the lateral hollow **52** is configured to be visible from outside of the holder **30** in the second direction D**2**.

[Third Modification]

A third modification of the first embodiment will be described, below. Description proceeds with a particular focus on a difference from the first embodiment, below.

Although not particularly mentioned in the first embodiment, in the third modification, as shown in FIG. **8** and FIG. **9**, the flavor inhaler includes a heat conduction member **200** and a cup member **300**, in addition to the holder **30** and the burning type heat source **50**.

The heat conduction member **200** is provided on an inner surface of the holder **30** in the supporting end portion **30**A of the holder **30**. The heat conduction member **200** is preferably formed of a metal material having an excellent heat conductivity, and is configured of aluminum, for example. A length of the heat conduction member **200** in the predetermined direction is preferably at least longer than a length of the cup member **300**. That is, the heat conduction member **200** projects toward the mouthpiece side end portion **30**B side relative to the cup member **300**. The length of the heat conduction member **200** may be the same as the length of the holder **30**.

The cup member **300** has a cup shape, houses the flavor source **32** (here, a flavor source), and holds the burning type heat source **50**. The cup member **300** is configured to be inserted into the supporting end portion **30**A of the holder **30**. In particular, the cup member **300** is configured by a tubular side wall **310** and by a bottom plate **320** covering one opening configured by the side wall **310**. The flavor source **32** (here, a flavor source) and the burning type heat source **50** are inserted into the cup member **300** from one opening configured by the side wall **310**. The bottom plate **320** has a plurality of air holes **320**A through which air passes.

Here, the flavor source **32** (here, a flavor source) is configured by powdery and granular tobacco leaf, for example. In such a case, a size of the air hole **320**A is smaller than a particle diameter of the tobacco leaf.

In the third modification, a thickness of the side wall **310** is preferably 0.1 mm or less. As a result, a heat capacity of the side wall **310** is reduced, and a heat generated from the burning type heat source **50** is efficiently transmitted to the flavor source. Further, the side wall **310** is preferably configured by SUS (for example, SUS430). As a result, even when the thickness of the side wall **310** is 0.1 mm or less, it is possible to obtain a sufficient strength as the strength of the side wall **310** so that the shape of the cup member **300** can be maintained. The bottom plate **320** is preferably configured by the same member (for example, SUS430) as the side wall **310**.

Experiment Result

An experiment result will be described, below. In an experiment described below, a mixture including 100 g of activated carbon, 90 g of calcium carbonate, 10 g of CMC-Na, and 270 g of water including 1 g of sodium chloride were kneaded, and a molding that was molded by extrusion-molding the kneaded mixture was dried. Then, by cutting the dried molding, a burning type heat source which has a longitudinal hollow with a length of 17 mm in the first direction, an outer diameter of 6.2 mm, and a diameter of 2.5 mm was obtained. Then, a sample used for the experiment was created by inserting such a burning type heat source approximately 5 mm into a substantially air impermeable paper tube holder with an inner diameter which was almost the same as an outer diameter of the burning type heat source.

Experiment Result 1

In an experiment result 1, a sample not having a lateral hollow was prepared as Comparative Example 1, and a sample having a lateral hollow at a distance of 4 mm from an ignition end was prepared as Comparative Example 2. Further, as Examples 1 to 6, a sample having a lateral hollow at a distance of 1 mm, 1.5 mm, 2 mm, 2.5 mm, 3.0 mm, and 3.5 mm from an ignition end was respectively prepared. By using these samples, a maximum temperature of gas flown into the paper tube holder from the burning type heat source in a second puff was measured. The samples according to the Examples 1 to 6 have four lateral hollows with a diameter of 2 mm. Further, in the present experiment, ignition was performed by keeping a heat generating portion of an electrothermal lighter at a position apart approximately 1 mm from the ignition end of the burning type heat source to perform preheating for 8 seconds, and then inhaling (puffing) for 2 seconds with a suction capacity of 55 mL. In a subsequent puff, the same inhaling operation as those described above was repeated at every 30 seconds, except for ignition operation using a lighter.

FIG. **10** is a graph showing the experiment result 1. As shown in FIG. **10**, it was confirmed that the maximum temperature in a second puff in the Examples 1 to 6 was high, as compared with the Comparative Example 1 and 2. That is, it was confirmed that when a distance from the ignition end to the lateral hollow was less than 4 mm, it was possible to increase a heat amount supplied since the burning position of the burning type heat source reaches the lateral hollow in at least second puff and a burning amount increases.

In view of improving the visibility of burning state of the burning type heat source, the distance from the ignition end to the lateral hollow in the first direction D**1** may be 5 mm or less. It should be noted that the lateral hollow turns red even when the distance from the ignition end to the lateral hollow is 4 mm or more and 5 mm or less.

Experiment Result 2

In an experiment result 2, the above-described samples of the Comparative Example 2 and Examples 1 to 3 were prepared. By using these samples, a maximum temperature of gas flown into the paper tube holder from the burning type heat source in the first to fourth puffs was measured. In the present experiment, ignition of the burning type heat source and inhaling operations were performed by using an electrothermal lighter, in the same way as in the experiment result 1.

FIG. **11** is a graph showing the experiment result 2. As shown in FIG. **11**, it was confirmed that variation in the maximum temperature of gas flown into the paper tube holder from the burning type heat source in the first to fourth puffs (initial puffs) was small in the Example 1, as compared with the Comparative Example 2 and Examples 2 and 3. It was confirmed that when the distance from the ignition end to the lateral hollow was 1 mm or less, it was possible to supply a more stable heat amount in a few puffs after ignition since the burning position of the burning type heat source exceeded the lateral hollow in puffs after the first puff, and since a cylindrical portion which is capable of supplying a stable heat amount burned.

Experiment Result 3

In an experiment result 3, a sample not having a lateral hollow was prepared as Comparative Example 11 and 12. Further, as Examples 11 to 15, a plurality of samples with a different air inflow rate from the ignition end were prepared. In particular, the sample according to the Example 11 has four lateral hollows with a diameter of 2.0 mm (air inflow rate=28%). The sample according to the Example 12 has two lateral hollows with a diameter of 2.5 mm (air inflow rate=33%). The sample according to the Example 13 has four lateral hollows with a diameter of 1.5 mm (air inflow rate=40%). The sample according to the Example 14 has four lateral hollows with a diameter of 1.0 mm (air inflow rate=60%). The sample according to the Example 15 has two lateral hollows with a diameter of 1.0 mm (air inflow rate=75%).

A sample burning type heat source was ignited by an electrothermal lighter in the Comparative Example 11, in the same way as in the experiment results 1 and 2, and was ignited by a gas lighter in the Comparative Example 12 and Examples 11 to 15. A specific method of igniting by the gas lighter was to make a flame of a gas lighter contact an ignition end of the sample burning type heat source to perform preheating for 3 seconds, and then to inhale for 2 seconds with an inhalation capacity of 55 mL. In each of the Comparative Example 11 and 12 and Examples 11 to 15, the maximum temperature of gas flown into the paper tube holder from the burning type heat source in puffs at the time of ignition as described above was measured.

FIG. **12** is a graph showing the experiment result 3. As shown in FIG. **12**, in the Examples 11 to 15, it was confirmed that it was possible to decrease the maximum temperature of gas flown into the paper tube holder from the burning type heat source in puffs, as compared with the Comparative Example 12. That is, when the air inflow rate was 75% or less, it was confirmed that even when ignition was performed by the gas lighter, an inflow of the flame of the gas lighter was restrained, therefore it was possible to decrease the maximum temperature of inflow gas flown from the burning type heat source in puffs at the time of ignition.

Particularly, in the Examples 11 to 13, it was confirmed that it was possible to decrease the maximum temperature of the burning type heat source in puffs to the same extent as the Comparative Example 11. When the air inflow rate was 40% or less, it was confirmed that even when ignition was performed by the gas lighter, an inflow of the flame of the gas lighter to the paper tube holder was restrained to the same extent as a case where ignition was performed by an electrothermal lighter which does not cause the inflow of the flame, therefore it was possible to decrease the maximum temperature of inflow gas flown from the burning type heat source in puffs at the time of ignition.

Other Embodiments

The present invention is explained through the above-described embodiment, but it must not be assumed that this invention is limited by the statements and the drawings constituting a part of this disclosure. From this disclosure, various alternative embodiments, examples, and operational technologies will become apparent to those skilled in the art.

In the embodiment, the holder **30** houses the flavor source **32** formed in a columnar shape, which is formed by covering powdery and granular tobacco leaf with a sheet having air permeability. However, the embodiment is not limited thereto. The holder **30** may house a filter (hereinafter, referred to as "capsule filter") incorporating a capsule for housing menthol, etc. The capsule filter is arranged at a mouthpiece side relative to the flavor source **32**. In such a case, the holder-side hollow **34** is preferably provided at an outer part of the capsule filter or at the ignition end **50**Ae side relative to the outer part of the capsule filter in the second direction D**2**.

In the embodiment, in a state where the holder **30** holds the burning type heat source **50**, the ignition end **50**Ae of the burning type heat source **50** protrudes from the holder **30** and the lateral hollow **52** is exposed from the holder **30**. However, the embodiment is not limited thereto. The holder **30** may be configured by a transparent member (such as glass), so that the lateral hollow **52** is visible through the holder **30**.

In addition, the entire contents of Japanese Patent Application No. 2013-048092 (filed on Mar. 11, 2013), Japanese Patent Application No. 2013-048093 (filed on Mar. 11, 2013) and Japanese Patent Application No. 2013-048094 (filed on Mar. 11, 2013) are incorporated in the present specification by reference.

INDUSTRIAL APPLICABILITY

According to the present invention, it is possible to provide a burning type heat source and a flavor inhaler with which it is possible to achieve both of supplying a stable heat amount in a puff performed from the middle to the latter half and increasing a heat amount supplied in a few puffs after ignition.

The invention claimed is:

1. A burning type heat source, comprising:

a body made of a flammable material extending along a first direction from an ignition end toward a non-ignition end,

a single longitudinal hollow extending through the flammable material along the first direction of the body; and

a lateral hollow extending through the flammable material along a second direction crossing the first direction, the lateral hollow communicating with the longitudinal hollow,

wherein the lateral hollow is provided closer to the ignition end in the first direction than the non-ignition end.

2. The heat source according to claim **1**, wherein a distance from the ignition end to the lateral hollow in the first direction is less than 4 mm.

3. The heat source according to claim **1**, wherein a distance from the ignition end to the lateral hollow in the first direction is 1 mm or less.

4. The heat source according to claim **1**, wherein an area of the longitudinal hollow in cross section perpendicular to the first direction is 1.77 mm^2 or more.

5. The heat source according to claim **1**, wherein an amount of inflow air from the longitudinal hollow at the ignition end is 40% or less of an amount of outflow air from the longitudinal hollow at the non-ignition end.

6. The burning type heat source according to claim **1**, wherein the body has a cylindrical shape extending along the first direction, and

wherein an outer diameter of the body is 3 mm or more and 15 mm or less.

7. The heat source according to claim **1**, wherein a length of the body in the first direction is 5 mm or more and 30 mm or less.

8. A flavor inhaler including:

a heat source made of flammable material extending along a first direction from an ignition end toward a non-ignition end; and

a holder holding the flammable heat source,

wherein the flammable heat source comprises:

a single longitudinal hollow extending through the flammable material along the first direction; and

a lateral hollow extending through the flammable material along a second direction crossing the first direction, the lateral hollow communicating with the longitudinal hollow, and

wherein the lateral hollow is provided closer to the ignition end in the first direction than the non-ignition end.

9. A flavor inhaler including:

a heat source made of flammable material extending along a first direction from an ignition end toward a non-ignition end; and

a holder holding the flammable heat source,

wherein the flammable heat source comprises:

a longitudinal hollow extending through the flammable material along the first direction; and

a lateral hollow extending through the flammable material along a second direction crossing the first direction, the lateral hollow communicating with the longitudinal hollow, and

wherein the lateral hollow is configured to be visible from outside of the holder in the second direction.

10. The flavor inhaler according to claim **9**, wherein the ignition end of the heat source protrudes from the holder, and

wherein the lateral hollow is exposed from the holder.

11. The flavor inhaler according to claim **9**, wherein a distance from the ignition end to the lateral hollow in the first direction is 5 mm or less.

12. The flavor inhaler according to claim **9**, wherein a burning stop position is provided in the heat source at the non-ignition end side relative to the lateral hollow in the first direction, and

wherein a distance from the lateral hollow to the burning stop position in the first direction is 5 mm or less.

13. The flavor inhaler according to claim **9**, wherein an area of the longitudinal hollow in cross section perpendicular to the first direction is larger than an area of the lateral hollow in cross section perpendicular to the second direction.

14. The flavor inhaler according to claim **9**, wherein an area of the longitudinal hollow in cross section perpendicular to the first direction is 1.77 mm^2 or more.

15. The flavor inhaler according to claim **9**, wherein the heat source has a cylindrical shape extending along the first direction, and

wherein an outer diameter of the heat source is 3 mm or more and 15 mm or less.

16. The flavor inhaler according to claim **9**, wherein a length of the heat source in the first direction is 5 mm or more and 30 mm or less.

17. A flavor inhaler including:

a heat source made of flammable material extending along a first direction from an ignition end toward a non-ignition end; and

a holder holding the flammable heat source; and

a lateral hollow extending through the flammable material along a second direction crossing the first direction, the lateral hollow communicating with the longitudinal hollow,

wherein the flammable heat source has a tubular shape including an outer wall that forms a single longitudinal hollow through the flammable material extending along the first direction,

an area of the longitudinal hollow in cross section perpendicular to the first direction is 1.77 mm^2 or more, and

an amount of inflow air from the longitudinal hollow at the ignition end is 75% or less of an amount of outflow air from a mouthpiece of the flavor inhaler.

18. The flavor inhaler according to claim **17**, wherein the amount of inflow air from the longitudinal hollow at the ignition end is 40% or less of the amount of outflow air from the mouthpiece of the flavor inhaler.

19. The flavor inhaler according to claim **17**, wherein the heat source comprises a lateral hollow extending along a second direction crossing the first direction, the lateral hollow communicating with the longitudinal hollow.

20. The flavor inhaler according to claim **17**, wherein the holder has a holder-side hollow opening toward a second direction crossing the first direction.

21. The flavor inhaler according to claim **20**, wherein the holder houses a flavor source, and

wherein the holder-side hollow is provided at an outer part of the flavor source or at the ignition end side relative to the outer part of the flavor source in the second direction.

22. The flavor inhaler according to claim **20**, wherein the holder houses a capsule filter, and

wherein the holder-side hollow is provided at an outer part of the capsule filter or at the ignition end side relative to the outer part of the capsule filter in the second direction.

23. The flavor inhaler according to claim **17**, wherein the heat source has a cylindrical shape extending along the first direction, and

wherein an outer diameter of the heat source is 3 mm or more and 15 mm or less.

24. The flavor inhaler according to claim **17**, wherein a length of the flammable heat source in the first direction is 5 mm or more and 30 mm or less.

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